

SECTION 23 05 19 - METERS, GAGES, THERMOMETERS, & TEST

PLUGS FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pressure Gauges, Gauge trim, and pressure gauge taps.
- B. Thermometers and thermometer wells.
- C. Pressure and Temperature Test Plugs.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. *Add as needed in your specifications.*

1.3 REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2007.
- C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

1.4 SUBMITTALS

- A. See Section *add other sections as needed.*
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.5 FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 PRESSURE GAUGES

- A. Manufacturers:
 - 1. Miljoco Inc
 - 2. Other as listed

- B. Pressure gauges at Pumps.
 - 1. Similar to Mijoco P4509LX-F series
 - 2. Accuracy: ASME B40.1 grade of 2A or better, $\pm 1/2\%$ of the entire range.
 - 3. Gauges to be dual scale of PSIG and Feet.
 - 4. Size: Dial glass 4-1/2" diameter or larger. System connection 1/4" NPT
 - 5. Case: Pressure gauges shall have cases and rings made of cast aluminum or stainless steel.
 - 6. Tubes and sockets: Phosphor bronze or stainless steel tubes. Brass or stainless steel sockets.
 - 7. Movement: stainless steel rotary type.
 - 8. Pointer: Black, micro-adjustable.
 - 9. Set Hand: Additional red set hand, manually adjustable to indicate minimum fill pressure.
 - 10. Gauges shall be rated for liquid temperatures to 200°F.

- C. All other pressure gauges.
 - 1. Similar to Miljoco P4598L series
 - 2. Accuracy: ASME B40.1 grade 1A or better, $\pm 1\%$ of the entire range.
 - 3. Size: Dial 4" diameter or larger. System connection 1/4" NPT
 - 4. Case: Pressure gauges shall have cases and rings made of stainless steel, nylon, or polypropylene.
 - 5. Pointer: Back aluminum, adjustable
 - 6. Tubes and sockets: Phosphor bronze or stainless steel tubes. Brass or stainless steel sockets.
 - 7. Movement: Brass or stainless steel.
 - 8. Gauges shall be rated for liquid temperatures to 200°F.

2.2 PRESSURE GAUGE TRIM

- A. Needle Valves: 1/4" NPT Brass or stainless steel. Minimum 300 psi (2068 kPa) working pressure. Provide for all gauges. Similar to Miljoco 1100-25-B or 1100-25-316 series

- B. Pressure Snubbers: 1/4" NPT Brass or stainless steel for minimum 300 psi (2068 kPa) working pressure. Required for all gauges at pumps and all gauges on steam systems. Similar to Miljoco 1200-25-B-2 or 1200-25-SS-2 series

- C. Coil Syphons: 1/4" NPT steel. Minimum 300 psi (2068 kPa) working pressure. Provide for all gauges on steam or condensate systems. Similar to Miljoco 1300-25-CS series

2.3 LIQUID-IN-GLASS TYPE THERMOMETERS (INSTALLED IN PIPING 12" AND LESS)

- A. Manufacturers:

1. Miljoco Inc
 2. Other as listed
- B. Thermometers - Adjustable Angle: Red, green, or blue-appearing non-toxic liquid in glass; ASME B40.200 & ASTM E1; cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
1. Similar to Mijoco SX-935 and SX-960
 2. Size: 9 inch (225 mm) scale.
 3. Case: Aluminum with enamel or powder coat finish
 4. Lens: Clear Lexan, acrylic, or polycarbonate.
 5. Stem: 3/4 inch (20 mm) NPT brass, 3-1/2" length through 8" pipe. 6" length 10" through 12" pipe.
 6. Range: Chilled Water 0-120°F, Condenser water 0-160°F, Hot water heating 30-240°F, Others – select a range with the average operating temperature at the midpoint $\pm 20^\circ\text{F}$
 7. Accuracy: ± 1 scale division
 8. Calibration: Degrees F.

2.4 BIMETAL THERMOMETERS (INSTALLED IN PIPING OVER 12"

- A. Manufacturers:
1. Miljoco Inc
 2. Other as listed
- B. Thermometers for pipe over 12" - Adjustable Angle: Bimetal dial type; ASME B40.200; external recalibrator in back; stainless steel adjustable bracket; adjustable 180 degrees in vertical plane.
1. Similar to Mijoco B5099-6 series
 2. Size: 5 inch (127 mm) dial.
 3. Case & Ring: 300 series stainless steel. Hermetically sealed
 4. Lens: Clear glass
 5. Dial: Anti-parallax aluminum with white finish and black markings with black needle
 6. Stem: 1/4" (12.7 mm) NPT 300 series stainless steel with 1/2" NPT connection, 6" stem length.
 7. Range: Chilled Water -40-160°F, Condenser water 25-125°F, Hot water heating 0-250°F, Others – select a range with the average operating temperature at the midpoint $\pm 20^\circ\text{F}$
 8. Accuracy: ± 1 full range (ASME B40.3 Grade A)
 9. Calibration: Degrees F.

2.5 THERMOMETER SUPPORTS

- A. Socket: Brass or stainless steel separable sockets (well) for thermometer stems with or without extensions as required. Minimum 300 psi (2068 kPa) working pressure.

2.6 TEST PLUGS

- A. Similar to Peterson Engineering "Petes plugs" or Miljoco
- B. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with dual nordel core for temperatures up to 250 degrees F (93 degrees C).
- C. Extensions: Provide 1-3/4" minimum brass extensions for pipe with insulation greater than 1"
- D. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch (60 mm) diameter pressure Gauges, one Gauge adapters with 1/8 inch (3 mm) probes, two 1 inch (25 mm) dial thermometers.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Gauges at Pumps: Provide one pressure Gauge per pump, installing taps before strainers and on suction and discharge of pump. Provide needle valves at each of the taps. Install pressure snubber at each gauge. Pipe to Gauge. Bobco Gauge piping kits with needle valves and gauge as specified in this section may be used on pumps.
- C. Gauges on Steam: Install pressure gauges with pulsation dampers. Provide and install needle valve to isolate each Gauge. Provide and install siphon on Gauges in steam and systems. Extend nipples and siphons to allow clearance from insulation.
- D. All other Gauges: Install pressure gauges Provide and install needle valve to isolate each Gauge. Extend nipples to allow clearance from insulation.
- E. Install thermometers in piping systems in sockets in short couplings. Install sockets so the liquid flows over the socket. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- F. Prime thermometer sockets with a heat transfer medium of oil or grease.
- G. Install Gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- H. Adjust Gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero. Adjust pump gauge red set indicator to match the fill pressure of the system.
- I. Locate test plugs where shown on drawings. Install extensions where the insulation is greater than 1". Turn test kit over to owner with O&M manuals.

END OF SECTION